Claims

1. A method for determining the sound velocity Cb in a base material (34), of a specimen to be tested using an ultrasonic probe comprising a transmitting transducer (24), a receiving transducer (26) and a precursor body (20), said precursor body (20) a) having a coupling surface (22) by which the probe is couplable to the base material (34), b) carrying the receiving transducer (26) and the transmitting transducer (24) and c) having a sound velocity Cv, the transmitting transducer (24) and the receiving transducer (26) being oriented to be inclined towards each other and each towards the coupling surface (22) so that a main transmission direction of the transmitting transducer (24) and a main receiving direction of the receiving transducer intersect below the coupling surface (22), transmitting transducer (24) and receiving transducer (26) being spaced apart at a center to center distance K, the transmitting transducer (24) and the receiving transducer (26) being spaced at a center to center distance Dv from the coupling surface (22), wherein an ultrasonic pulse is generated by the transmitting transducer (24) and passes through the precursor body (20) into the base material (34), the ultrasonic pulse produces a creeping wave (35) in the base material, a portion of the creeping wave reaches the receiving transducer (26) via the precursor body (20), the shortest sound travel time Ttot of the ultrasonic pulse is measured and the sound velocity Cb in the base material (34) is determined by the very path between the transmitting transducer (24) and the receiving transducer that supplies the shortest total travel time Ttot.

2. The method according to claim 1, wherein the path that supplies the shortest total travel time Ttot is determined by summing up the travel distance from the transmitting transducer (24) to the base material (34), the travel distance within the base material (34) and the travel distance from the base material (34) to the receiving transducer (26) and by

optimizing said travel distances with regard to the shortest total travel time Ttot.

3. The method according to claim 1, wherein the shortest total travel time Ttot is obtained through

$$T_{tot} = \frac{K}{Cb} + 2Dv\left(\frac{1}{Cv\cos(\arcsin(\frac{Cv}{Cb}))} - \frac{\tan(\arcsin(\frac{Cv}{Cb}))}{Cb}\right).$$

4. A device for carrying out the method according to claim 1, wherein transmitting transducer (24) and receiving transducer (26) are built according to the same principle, the main beams (38, 40) of transmitting transducer (24) and the receiving transducer (26) lie in the same plane and these main beams (38, 40) are inclined at the same angle relative to the coupling surface (22).

5. A method for determining the sound velocity in a coating material applied as a layer (46) on the base material (34) by which method the sound velocity Cb in the base material (34) is first determined according to claim 1 and the probe is placed onto the layer (46) having a thickness Ds, an ultrasound pulse is generated by the transmitting transducer (24) that traverses both the precursor body (20) and the layer (46) at an incline toward the coupling surface (22) and produces a creeping wave in the base material (34) a portion of which creeping wave again traverses the layer (46) and the precursor body (20) at an incline toward the coupling surface prior to reaching the receiving transducer (26), the receive signal with the shortest total travel time Ttot is registered and measured and the coating thickness Ds of the layer (46) is determined from that path that supplies the shortest total travel time Ttot.

6. The method for determining the sound velocity Cs in a coating material according to claim 5, wherein the shortest travel time Ttot is obtained from

$$Ttot = \frac{K}{Cb} + 2(Dv(\frac{1}{Cv\cos\arcsin(\frac{Cv}{Cb})} - \frac{\tan\arcsin(\frac{Cv}{Cb})}{Cb}) + Ds(\frac{1}{Cs\cos\arcsin(\frac{Cs}{Cb})} - \frac{\tan\arcsin(\frac{Cs}{Cb})}{Cb})),$$

where Ds = the thickness of the layer.

7. The method according to claim 1, wherein the path that supplies the shortest total travel time Ttot is determined by summing up the travel distance from the transmitting transducer (24) to the base material (34), the travel distance within the base material (34) and the travel distance from the base material (34) to the receiving transducer (26) and by differentiation after the angle.